DECLARATION OF DR. RANDELL L. MILLS

I, Randell L. Mills, declare and state as follows:

1. I am the founder and CEO of BlackLight Power, Inc., located at 493 Old Trenton Road, Cranbury, New Jersey 08512.

2. I majored in chemistry and received my bachelor of arts degree, *summa cum laude* and Phi Beta Kappa, from Franklin & Marshall College in 1982. I received a medical degree from Harvard Medical School in 1986. While attending Harvard Medical School, I concurrently spent a year taking courses in advanced electrical engineering at the Massachusetts Institute of Technology. I have also had significant academic training in biology, chemistry, mathematics and physics.

3. I began my research in the field of energy technology over ten years ago. I have authored, co-authored or collaborated on numerous publications, reports and presentations at scientific meetings in the field of energy technology and novel hydrogen chemistry, as shown in the attachment hereto.

4. I am fully qualified to conduct the research that led to the discovery and development of BlackLight's lower-energy hydrogen technology.

5. I personally conducted and/or supervised the experimental data disclosed in the articles submitted to the U.S. Patent and Trademark Office ("PTO"), which are described in the following Paragraph Nos. 6 through 30. The coauthors, if any, assisted me in preparing the data.

6. **R. Mills, J. Sankar, P. Ray, B. Dhandapani, J. He, "Spectroscopic Characterization of the Atomic Hydrogen Energies and Densities and Carbon Species During Helium-Hydrogen-Methane Plasma CVD Synthesis of Single Crystal Diamond Films", Chemistry of Materials, submitted.**

Single crystal diamond films were synthesized on silicon substrates for the first time without diamond seeding by a microwave plasma reaction of a mixture of helium-hydrogen-methane (48.2/48.2/3.6%). The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS), Raman spectroscopy, and X-ray diffraction (XRD). It is proposed that He^{+} served as a catalyst with atomic hydrogen to form an energetic plasma. CH, C_2, and C_3 emission were observed with significantly broadened H α, β, γ, and δ lines. The average hydrogen atom temperature of a helium-hydrogen-methane plasma was measured to be $120 - 140\ eV$ versus $\approx 3\ eV$ for pure hydrogen. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond. Then, by this novel pathway, the relevance of the $C-H-O$ tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

7. **R. Mills, P. Ray, R. M. Mayo, "Stationary Inverted Balmer and Lyman Populations for a CW HI Water-Plasma Laser", IEEE Transactions on Plasma Science, submitted.**

Stationary inverted H Balmer and Lyman populations were observed from a low pressure water-vapor microwave discharge plasma. The ionization and population of excited atomic hydrogen levels was attributed to energy provided by a catalytic resonance energy transfer between hydrogen atoms and molecular oxygen formed in the water plasma. The catalysis mechanism was supported by the observation of O^{2+} and H Balmer line broadening of 55 eV compared to 1 eV for hydrogen alone. The high hydrogen atom temperature with a relatively low electron temperature, $T_e = 2\ eV$, exhibited characteristics of cold recombining plasmas. These conditions of a water plasma favored an inverted population in the lower levels. Thus, the catalysis of atomic hydrogen may pump a cw HI laser. From our results, laser oscillations are may be possible from i) $n = 3$, $n = 4$, $n = 5$, $n = 6$, $n = 7$ and $n = 8$ to $n = 2$, ii) $n = 4$, $n = 5$, $n = 6$, and $n = 7$ to $n = 3$ and iii) $n = 5$ and $n = 6$ to $n = 4$. Lines of the Balmer series of $n = 5$, and $n = 6$ to $n = 2$ and the Paschen series of $n = 5$ to $n = 3$ were of particular importance because of the potential to design blue and 1.3 micron infrared lasers, respectively, which are ideal for many communications and microelectronics applications. At a microwave input power of $9\ W \cdot cm^{-3}$, a collisional radiative model showed that the hydrogen excited state population distribution was consistent with an $n = 1 \rightarrow 5,6$ pumping power of an unprecedented $200\ W \cdot cm^{-3}$. High power hydrogen gas lasers are anticipated at wavelengths, over a broad spectral range from far infrared to violet which may be miniaturized to micron dimensions. Such a hydrogen laser represents the first new atomic gas laser in over a decade, and it may prove to be the most efficient, versatile, and useful of all. A further application is the direct generation of electrical power using photovoltaic conversion of the spontaneous or stimulated water vapor plasma emission.

8. **R. L. Mills, P. Ray, B. Dhandapani, J. He, "New Energy States of Atomic Hydrogen Formed in a Catalytic Helium-Hydrogen Plasma", IEEE Transactions on Plasma Science, submitted.**

Extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6\,eV$ where $q = 1,2,3,4,6,7,8,9,11$ or these lines inelastically scattered by helium wherein 21.2 eV was absorbed in the excitation of $He\,(1s^2)$ to $He\,(1s^1 2p^1)$. The average hydrogen atom temperature was measured to be $180 - 210\,eV$ versus $\approx 3\,eV$ for pure hydrogen. The electron temperature T_e for helium-hydrogen was 28,000 K compared to 6800 K for pure helium. Known explanations for the novel series of spectral lines and extraordinary broadening were ruled out.

9. **R. Mills, P. Ray, R. Mayo, "Water-Plasma Medium for a Hydrogen Laser", J of Phys. Chem. Lett., submitted.**

A stationary, electronically-excited, population inversion of atomic hydrogen, H, has been observed in a low pressure water-vapor microwave discharge plasma. The inverted H population was evident from the relative intensities of the transitions within the Lyman series (n = 2, 3, 4, and 5 to n = 1) and within the Balmer series (n = 3, 4, 5, 6, 7, and 8 to n = 2). Lines of the Balmer series of n = 5, and 6 to n = 2 and the Paschen series of n = 5 to n = 3 were of particular importance because of the potential to design blue and 1.3 micron infrared lasers, respectively, which are ideal for many communications and microelectronics applications. High power hydrogen gas lasers are anticipated at wavelengths, over a broad spectral range from far infrared to violet which may be miniaturized to micron dimensions. Such a hydrogen laser represents the first new atomic gas laser in over a decade, and it may prove to be the most versatile and useful of all.

10. **R. Mills, P. Ray, R. Mayo, "The Potential for an Extremely Versatile Hydrogen Water-Plasma Laser", Phys. Rev. E, submitted.**

Stationary inverted H Balmer and Lyman populations were observed from a low pressure water-vapor microwave discharge plasma. The ionization and population of excited atomic hydrogen levels was attributed to energy provided by a catalytic resonance energy transfer between hydrogen atoms and molecular oxygen formed in the water plasma. The catalysis mechanism was supported by the observation of O^{2+} and H Balmer line broadening of 55 eV compared to 1 eV for hydrogen alone. The high hydrogen atom temperature with a relatively low electron temperature, $T_e = 2\ eV$, exhibited characteristics of cold recombining plasmas. These conditions of a water plasma favored an inverted population in the lower levels. Thus, the catalysis of atomic hydrogen may pump a cw HI laser. From our results, laser oscillations are expected from i) $n=3$, $n=4$, $n=5$, $n=6$, $n=7$ and $n=8$ to

$n=2$, ii) $n=4$, $n=5$, $n=6$, and $n=7$ to $n=3$ and iii) $n=5$ and $n=6$ to $n=4$. Lines of the Balmer series of $n=5$, and $n=6$ to $n=2$ and the Paschen series of $n=5$ to $n=3$ were of particular importance because of the potential to design blue and 1.3 micron infrared lasers, respectively, which are ideal for many communications and microelectronics applications. High power hydrogen gas lasers are anticipated at wavelengths, over a broad spectral range from far infrared to violet which may be miniaturized to micron dimensions. Such a hydrogen laser represents the first new atomic gas laser in over a decade, and it may prove to be the most versatile and useful of all.

11. **R. L. Mills, B. Dhandapani, J. He, J. Sankar, "CVD Synthesis of Single Crystal Diamond Films on Silicon Substrates Without Seeding", Diamond and Related Materials, submitted.**

Single crystal diamond films were synthesized on silicon substrates for the first time without diamond seeding by a microwave plasma reaction of a mixture of 10-30% hydrogen, 90-70% helium, and 1-10% CH_4. The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS), Raman spectroscopy, and X-ray diffraction (XRD). It is proposed that He^+ served as a catalyst with atomic hydrogen to form an energetic plasma. The average hydrogen atom temperature was measured to be $180-210\ eV$ versus $\approx 3\ eV$ for pure hydrogen. The electron temperature T_e for helium-hydrogen was 28,000 K compared to 6800 K for pure helium. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond. Then, by this novel pathway, the relevance of the $C-H-O$ tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

12. **R. L. Mills, X. Chen, P. Ray, J. He, B. Dhandapani, "Plasma Power Source Based on a Catalytic Reaction of Atomic Hydrogen Measured by Water Bath Calorimetry", Thermochimica Acta, submitted.**

Extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6\ eV$ where $q=1,2,3,4,6,7,8,9,11$ or these lines inelastically scattered by helium wherein $21.2\ eV$ was absorbed in the excitation of $He\,(1s^2)$ to $He\,(1s^1 2p^1)$. The average hydrogen atom temperature was measured to be $180-210\ eV$ versus $\approx 3\ eV$ for pure hydrogen. The electron temperature T_e for helium-hydrogen was 28,000 K compared to 6800 K for pure helium. Dominant He^+ emission and an intensification of the plasma emission observed when He^+ was present with atomic hydrogen demonstrated the role of He^+ as a catalyst. Using water bath calorimetry, excess power was observed from the helium-hydrogen plasma compared to control krypton plasma. For example, for an input of

8.1 W, the total plasma power of the helium-hydrogen plasma measured by water bath calorimetry was 30.0 W corresponding to 21.9 W of excess power in 3 cm^3. The excess power density and energy balance were high, 7.3 W/cm^3 and $-2.9\,X\,10^4$ $kJ/mole\,H_2$, respectively.

13. **R. L. Mills, A. Voigt, B. Dhandapani, J. He, "Synthesis and Spectroscopic Identification of Lithium Chloro Hydride", Materials Characterization, submitted.**

A novel inorganic hydride compound, lithium chloro hydride ($LiHCl$), which comprises a high binding energy hydride ion was synthesized by reaction of atomic hydrogen with potassium metal and lithium chloride. Lithium chloro hydride was identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy, ^1H nuclear magnetic resonance spectroscopy, and powder X-ray diffraction. Hydride ions with increased binding energies may form many novel compounds with broad applications such as the oxidant of a high voltage battery.

14. **R. L. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride", J of Materials Research, submitted.**

A novel highly stable surface coating $SiH(1/p)$ which comprised high binding energy hydride ions was synthesized by microwave plasma reaction of mixture of silane, hydrogen, and helium wherein it is proposed that He^+ served as a catalyst with atomic hydrogen to form the highly stable hydride ions. Novel silicon hydride was identified by time of flight secondary ion mass spectroscopy and X-ray photoelectron spectroscopy. The time of flight secondary ion mass spectroscopy (ToF-SIMS) identified the coatings as hydride by the large SiH^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. X-ray photoelectron spectroscopy (XPS) identified the H content of the SiH coatings as hydride ions, $H^-(1/4)$, $H^-(1/9)$, and $H^-(1/11)$ corresponding to peaks at 11, 43, and 55 eV, respectively. The silicon hydride surface was remarkably stable to air as shown by XPS. The highly stable amorphous silicon hydride coating may advance the production of integrated circuits and microdevices by resisting the oxygen passivation of the surface and possibly altering the dielectric constant and band gap to increase device performance.

15. **R. L. Mills, B. Dhandapani, J. He, J. Sankar, "Synthesis of Diamond Films from Solid Carbon", Diamond and Related Materials, submitted.**

A novel diamond-like carbon film terminated with $CH(1/p)$ (H^*DLC) comprising high binding energy hydride ions was synthesized for the first time from solid carbon by a microwave plasma reaction of a mixture of 10-30% hydrogen and 90-70% helium wherein it is proposed that He^+ served as a catalyst with atomic hydrogen to form the highly stable hydride ions. H^*DLC was identified by time of flight secondary ion mass spectroscopy (ToF-SIMS) and X-ray photoelectron

spectroscopy (XPS). TOF-SIMS identified the coatings as hydride by the large H^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. The XPS identification of the H content of the CH coatings as hydride ion $H^-(1/10)$ corresponding to a peak at 49 eV has implications that the mechanism of the diamond-like carbon formation involves one or both of selective etching of graphitic carbon and the activation of surface carbon by the hydrogen catalysis product. Thus, a novel H intermediate formed by the plasma catalysis reaction may serve the role of H, oxygen species, CO, or halogen species used in past systems. Bombardment of the diamond surface by observed, highly energetic species formed by the catalysis reaction may also play a role. By a novel pathway, the relevance of the $C-H-O$ tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

16. **R. Mills, P. Ray, R. M. Mayo, "The Potential for a Hydrogen Water-Plasma Laser", Applied Physics Letters, submitted.**

A stationary, electronically-excited, population inversion of atomic hydrogen, H, has been observed in a low pressure water-vapor microwave discharge plasma. The inverted H population was evident from the relative intensities of the transitions within the Lyman series (n = 2, 3, 4, and 5 to n = 1) and within the Balmer series (n = 3, 4, 5, 6, 7, and 8 to n = 2). Lines of the Balmer series of n = 5, and 6 to n = 2 and the Paschen series of n = 5 to n = 3 were of particular importance because of the potential to design blue and 1.3 micron infrared lasers, respectively, which are ideal for many communications and microelectronics applications. High power hydrogen gas lasers are anticipated at wavelengths, over a broad spectral range from far infrared to violet which may be miniaturized to micron dimensions. Such a hydrogen laser represents the first new gas laser in over a decade, and it may prove to be the most versatile and useful of all.

17. **R. L. Mills, "Classical Quantum Mechanics", Physica Scripta., submitted.**

Despite it successes, quantum mechanics (QM) has remained mysterious to all who have encountered it. Starting with Bohr and progressing into the present, the departure from intuitive, physical reality has widened. The connection between quantum mechanics and reality is more than just a "philosophical" issue. It reveals that quantum mechanics is not a correct or complete theory of the physical world and that inescapable internal inconsistencies and incongruities with physical observation arise when attempts are made to treat it as a physical as opposed to a purely mathematical "tool". Some of these issues are discussed in a review by Laloë [F. Laloë, Do we really understand quantum mechanics? Strange correlations, paradoxes, and theorems, Am. J. Phys. 69 (6), June 2001, 655-701]. In an attempt to provide some physical insight into atomic problems and starting with the

same essential physics as Bohr of e^- moving in the Coulombic field of the proton and the wave equation as modified by Schrödinger, a classical approach is explored which yields a model which is remarkably accurate and provides insight into physics on the atomic level. The proverbial view deeply seated in the wave-particle duality notion that there is no large-scale physical counterpart to the nature of the electron may not be correct. Physical laws and intuition may be restored when dealing with the wave equation and quantum mechanical problems. Specifically, a theory of classical quantum mechanics (CQM) is derived from first principles that successfully applies physical laws on all scales. Using Maxwell's equations, the classical wave equation is solved with the constraint that a bound electron cannot radiate energy. By further application of Maxwell's equations to electromagnetic and gravitational fields at particle production, the Schwarzschild metric (SM) is derived from the classical wave equation which modifies general relativity to include conservation of spacetime in addition to momentum and matter/energy. The result gives a natural relationship between Maxwell's equations, special relativity, and general relativity. CQM holds over a scale of spacetime of 85 orders of magnitude—it correctly predicts the nature of the universe from the scale of the quarks to that of the cosmos.

18. **R. L. Mills, P. Ray, "Spectroscopic Characterization of Stationary Inverted Lyman Populations and Free-Free and Bound-Free Emission of Lower-Energy State Hydride Ion Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Group I Catalysts," Quantitative Spectroscopy and Radiative Transfer, submitted.**

Rb^+ to Rb^{2+} and $2K^+$ to $K + K^{2+}$ each provide a reaction with a net enthalpy equal to the potential energy of atomic hydrogen. The presence of these gaseous ions with thermally dissociated hydrogen formed a plasma having strong VUV emission with a stationary inverted Lyman population. Significant Balmer α line broadening of 18 and 12 eV was observed from a rt-plasma of hydrogen with KNO_3, and $RbNO_3$, respectively, compared to $3\ eV$ from a hydrogen microwave plasma. We propose an energetic catalytic reaction involving a resonance energy transfer between hydrogen atoms and Rb^+ or $2K^+$ to form a very stable novel hydride ion. Its predicted binding energy of $3.0468\ eV$ with the fine structure was observed at 4071 Å, and its predicted bound-free hyperfine structure lines $E_{HF} = j^2 3.00213\ X 10^{-5} + 3.0563\ eV$ (j is an integer) matched those observed for $j = 1$ to $j = 37$ to within a 1 part per 10^4. Characteristic emission from each catalyst was observed. This catalytic reaction may pump a cw HI laser.

19. **R. Mayo, R. Mills, "Direct Plasmadynamic Conversion of Plasma Thermal Power to Electricity for Microdistributed Power Applications", 40th Annual Power Sources Conference, Cherry Hill, NJ, June 10-13, (2002), in press.**

A microwave plasma source with input power levels up to 12.83 W/cm^3 that provides reproducible, stable plasmas with power densities on the order of those of chemically assisted (CA-) plasmas was used to characterize plasmadynamic power conversion (PDC) of plasma thermal power to electricity. PDC extracted electrical power approaching 2 W has been achieved as a demonstration. It is envisioned that such a system may be readily scaled to a few hundred Watts to several 10's of kW output power for microdistributed commercial applications (e.g. household, automotive, light industry, and space based power). The most important consideration in collector output performance is shown to be plasma conductivity. Increasing collector surface area in contact with the plasma, plasma charge carrier density, and plasma temperature, and reducing the fill gas pressure all increase the extracted power. Peak performance is found at 0.5 Torr fill of He at 50 sccm at 8.55 W/cm^3 input power where the load match is 250 W and peak extracted power is 1.87 W or 3.6 W/cm^3 (21.8 V, 86 mA) for a volumetric conversion efficiency of 42%.

20. **R. Mills, P. Ray, R. Mayo, "Chemically-Generated Stationary Inverted Lyman Population for a CW HI Laser", J Vac. Sci. and Tech. A, submitted.**

Each of the ionization of Rb^+ and cesium and an electron transfer between two K^+ ions (K^+ / K^+) provide a reaction with a net enthalpy of an integer multiple of the potential energy of atomic hydrogen, 27.2 eV. The corresponding Group I nitrates provide these reactants as volatilized ions directly or as atoms by undergoing decomposition or reduction to the corresponding metal. The presence of each of the reactants identified as providing an enthalpy of 27.2 eV formed a low applied temperature, extremely low voltage plasma in atomic hydrogen called a resonance transfer or rt-plasma having strong vacuum ultraviolet (VUV) emission. In contrast, magnesium and aluminum atoms or ions do not ionize at integer multiples of the potential energy of atomic hydrogen. $Mg(NO_3)_2$ or $Al(NO_3)_3$ did not form a plasma and caused no emission.

For further characterization, we recorded the width of the 6563 Å Balmer α line on light emitted from rt-plasmas. Significant line broadening of 18, 12, *and* 12 eV was observed from a rt-plasma of hydrogen with KNO_3, $RbNO_3$, and $CsNO_3$, respectively, compared to 3 eV from a hydrogen microwave plasma. These results could not be explained by Stark or thermal broadening or electric field acceleration of charged species since the measured field of the incandescent heater was extremely weak, 1 V/cm, corresponding to a broadening of much less than 1 eV. Rather the source of the excessive line broadening is consistent with that of the observed VUV emission, an energetic reaction caused by a resonance energy transfer between hydrogen atoms and K^+ / K^+, Rb^+, and cesium, which serve as catalysts.

KNO_3 and $RbNO_3$ formed the most intense plasma. Remarkably, a stationary inverted Lyman population was observed in the case of an rt-plasma formed with potassium and rubidium catalysts.

These catalytic reactions may pump a cw HI laser as predicted by a collisional radiative model used to determined that the observed overpopulation was above threshold.

21. **R. L. Mills, P. Ray, B. Dhandapani, J. Dong, S. Hicks, M. Nansteel, X. Chen, J. He, R. Mayo, Plasma Power Source Based on a Catalytic Reaction of Atomic Hydrogen, Fuels and Energy, submitted.**

Extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6\, eV$ where $q = 1,2,3,4,6,7,8,9,11$ or these lines inelastically scattered by helium wherein 21.2 eV was absorbed in the excitation of $He\,(1s^2)$ to $He\,(1s^1 2p^1)$. The average hydrogen atom temperature was measured to be $180\text{-}210\, eV$ versus $\approx 3\, eV$ for pure hydrogen. The electron temperature T_e for helium-hydrogen was 28,000 K compared to 6800 K for pure helium. Using heat loss and Calvet calorimetry, excess power was observed from the helium-hydrogen plasma compared to control xenon or krypton plasmas. For example, for an input of 22 W, the total plasma power of the helium-hydrogen plasma measured by Calvet calorimetry was 60 W corresponding to 38 W of excess power in 0.32 cm^3. The excess power density and energy balance were very high, 120 W/cm^3 and $-1.3\, X\, 10^5\ kJ/mole\, H_2$, respectively.

22. **R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", J. Phys. Chem. Lett., submitted.**

A new chemically generated plasma source is reported. The presence of gaseous Rb^+ or K^+ ions with thermally dissociated hydrogen formed a low applied temperature, extremely low voltage plasma called a resonance transfer or rt-plasma having strong vacuum ultraviolet (VUV) emission. We propose an energetic catalytic reaction involving a resonance energy transfer between hydrogen atoms and Rb^+ or $2K^+$ since Rb^+ to Rb^{2+}, $2K^+$ to $K + K^{2+}$, and K to K^{3+} each provide a reaction with a net enthalpy equal to the potential energy of atomic hydrogen. Remarkably, a stationary inverted Lyman population was observed; thus, these catalytic reactions may pump a cw HI laser as predicted by a collisional radiative model used to determined that the observed overpopulation was above threshold.

23. **R. Mills, "A Maxwellian Approach to Quantum Mechanics Explains the Nature of Free Electrons in Superfluid Helium", Foundations of Science, submitted.**

From the time of its inception, the quantum mechanical meaning of the electron wave function has been enigmatic, debated, and fluid. A now popular interpretation is a zero or one-dimensional point in an all-space probability wave function $\Psi(x)$ that only becomes "real" by act of measurement.

However, the behavior of free electrons in superfluid helium has again forced the issue of the meaning of the wavefunction and its connection with reality. Electrons form bubbles in superfluid helium which reveal that the electron is real and that a physical interpretation of the wavefunction is necessary. It is time for the physical rather than the mathematical nature of the wavefunction to be determined. Using Maxwell's equations, the classical wave equation is solved with the constraint that a bound electron cannot radiate energy to give closed form physical solutions for the electron in atoms, the free electron, and the free electron in superfluid helium. The prediction of fractional principal quantum energy states of the electron in liquid helium and their behavior match the formerly inexplicable photoconductivity and mobility observations.

24. **R. Mills and M. Nansteel, P. Ray, "Bright Hydrogen-Light Source due to a Resonant Energy Transfer with Strontium and Argon Ions", New Journal of Physics, submitted.**

A plasma called an rt-plasma formed with a low field (1V/cm), at low temperatures (e.g. $\approx 10^3\ K$), from atomic hydrogen generated at a tungsten filament and strontium which was vaporized by heating the metal. Strong VUV emission was observed that increased with the addition of argon, but not when sodium, magnesium, or barium replaced strontium or with hydrogen, argon, or strontium alone. Characteristic strontium and argon emission was observed which supported a resonance-energy-transfer mechanism. Significant Balmer α line broadening corresponding to an average hydrogen atom temperature of 14, 24 eV, and 23-45 eV was observed for strontium and argon-strontium rt-plasmas and discharges of strontium-hydrogen, helium-hydrogen, argon-hydrogen, strontium-helium-hydrogen, and strontium-argon-hydrogen, respectively, compared to $\approx 3\ eV$ for pure hydrogen, krypton-hydrogen, xenon-hydrogen, and magnesium-hydrogen. To achieve that same optically measured light output power, hydrogen-sodium, hydrogen-magnesium, and hydrogen-barium mixtures required 4000, 7000, and 6500 times the power of the hydrogen-strontium mixture, respectively, and the addition of argon increased these ratios by a factor of about two. A glow discharge plasma formed for hydrogen-strontium mixtures at an extremely low voltage of about 2 V compared to 250 V for hydrogen alone and sodium-hydrogen mixtures, and 140-150 V for hydrogen-magnesium and hydrogen-barium mixtures.

25. **R. Mills, P. Ray, R. Mayo, "CW HI Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, submitted.**

Each of the ionization of Rb^+ and cesium and an electron transfer between two K^+ ions (K^+ / K^+) provide a reaction with a net enthalpy of an integer multiple of the potential energy of atomic hydrogen, 27.2 eV. The corresponding Group I nitrates provide these reactants as volatilized ions directly or as atoms by undergoing decomposition or reduction to the corresponding metal. The

presence of each of the reactants identified as providing an enthalpy of $27.2\ eV$ formed a low applied temperature, extremely low voltage plasma called a resonance transfer or rt-plasma having strong vacuum ultraviolet (VUV) emission. In contrast, magnesium and aluminum atoms or ions do not ionize at integer multiples of the potential energy of atomic hydrogen. $Mg(NO_3)_2$ or $Al(NO_3)_3$ did not form a plasma and caused no emission.

For further characterization, we recorded the width of the 6563 Å Balmer α line on light emitted from rt-plasmas. Significant line broadening of 18, 12, *and* 12 eV was observed from a rt-plasma of hydrogen with KNO_3, $RbNO_3$, and $CsNO_3$, respectively, compared to $3\ eV$ from a hydrogen microwave plasma. These results could not be explained by Stark or thermal broadening or electric field acceleration of charged species since the measured field of the incandescent heater was extremely weak, 1 V/cm, corresponding to a broadening of much less than $1\ eV$. Rather the source of the excessive line broadening is consistent with that of the observed VUV emission, an energetic reaction caused by a resonance energy transfer between hydrogen atoms and K^+/K^+, Rb^+, and cesium, which serve as catalysts.

KNO_3 and $RbNO_3$ formed the most intense plasma. Remarkably, a stationary inverted Lyman population was observed in the case of an rt-plasma formed with potassium and rubidium catalysts. These catalytic reactions may pump a cw HI laser as predicted by a collisional radiative model used to determined that the observed overpopulation was above threshold.

26. **R. L. Mills, P. Ray, J. Dong, M. Nansteel, B. Dhandapani, J. He, "Vibrational Spectral Emission of Fractional-Principal-Quantum-Energy-Level Molecular Hydrogen", Vibrational Spectroscopy, submitted.**

Extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6\ eV$ where $q = 1,2,3,4,6,7,8,9,11$ or these lines inelastically scattered by helium wherein $21.2\ eV$ was absorbed in the excitation of $He\,(1s^2)$ to $He\,(1s^1 2p^1)$. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen, formed by a resonant nonradiative energy transfer to He^+. Corresponding emission due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at $E_{D+vib} = p^2 E_{D\,H_2} \pm \left(\frac{\upsilon^*}{3}\right) E_{vib\,H_2(\upsilon=0\rightarrow\upsilon=1)}$, $\upsilon^* = 1,2,3...$ was observed at the longer wavelengths for $\upsilon^* = 2$ to $\upsilon^* = 32$ and at the shorter wavelengths for $\upsilon^* = 1$ to $\upsilon^* = 16$ where $E_{D\,H_2}$ and $E_{vib\,H_2(\upsilon=0\rightarrow\upsilon=1)}$ are the experimental bond and vibrational energies of H_2, respectively. Similar emission due to Ne^+ with hydrogen was also observed, and the exothermic reaction was confirmed by the observation of $306 \pm 5\ W$ of excess power generated in $45\ cm^3$ by a compound-hollow-cathode-glow discharge of a neon-hydrogen (99.5/0.5%) mixture corresponding to a power density of

$6.8\ MW/m^3$ and an energy balance of at least $-1\ X10^6\ kJ/mole\ H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8\ kJ/mole\ H_2$.

27. **R. L. Mills, P. Ray, E. Dayalan, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Inductively and Capacitively Coupled RF, Microwave, and Glow Discharge Hydrogen Plasmas with Certain Catalysts", IEEE Transactions on Plasma Science, submitted.**

From the width of the 656.3 nm Balmer α line emitted from inductively and capacitively coupled RF, microwave, and glow discharge plasmas, it was found that inductively coupled RF helium-hydrogen and argon-hydrogen plasmas showed extraordinary broadening corresponding to an average hydrogen atom temperature of $250-310\ eV$ and $180-230\ eV$, respectively, compared to $30-40\ eV$ and $50\text{-}60\ eV$, respectively, for the corresponding capacitively coupled plasmas. Microwave helium-hydrogen and argon-hydrogen plasmas showed significant broadening corresponding to an average hydrogen atom temperature of $180\text{-}210\ eV$ and $110\text{-}130\ eV$, respectively. The corresponding results from the glow discharge plasmas were $33\text{-}38\ eV$ and $30\text{-}35\ eV$, respectively, compared to $\approx 4\ eV$ for plasmas of pure hydrogen, neon-hydrogen, and xenon-hydrogen maintained in any of the sources. Similarly, the average electron temperatures T_e for helium-hydrogen and argon-hydrogen inductively coupled RF and microwave plasmas were high, $39,600 \pm 5\%\ K$, $15,800 \pm 5\%\ K$, $28,000 \pm 5\%\ K$, and $11,600 \pm 5\%\ K$, respectively; compared to $7590 \pm 5\%\ K$, $6000 \pm 5\%\ K$, $6500 \pm 5\%\ K$, and $5500 \pm 5\%\ K$ for the corresponding plasmas of xenon-hydrogen and hydrogen alone, respectively. Stark broadening or acceleration of charged species due to high electric fields can not explain the inductively coupled RF and microwave results since the electron density was low and no high field was present. Rather, a resonant energy transfer mechanism is proposed.

28. **R. Mayo, R. Mills, M. Nansteel, "Direct Plasmadynamic Conversion of Plasma Thermal Power to Electricity", IEEE Transactions on Plasma Science, submitted.**

The generation of electrical energy using direct plasmadynamic conversion (PDC) is studied experimentally for small-scale, chemically-assisted plasmas (CA-plasma) for the first time. Glow discharge and microwave generated plasma sources are operated at power levels on the order of a few to 50 Watts in the discharge case and up to 12.83 W/cm^3 in the microwave case. Extracted power approaching 1/4 W has been achieved as a demonstration. It is envisioned that such a system may be readily scaled to a few hundred Watts to several 10's of kW output power for microdistributed commercial applications (e.g. household, automotive, light industry, and space based power). Three quarter in. long by 0.040 in. diameter cylindrical PDC electrodes have been tested in a 10 – 50 W

direct current, glow discharge plasma device with He or Ar as the working gas at 0.3 – 3.0 Torr. The PDC anode was magnetized in the range of 0 – 700 G with a 1.5 inch water cooled Helmholtz electromagnet. Open circuit voltages up to 6.5 V were obtained across the PDC electrodes at 1 Torr He and 350 G field. The collector voltage was shown to be a function of applied magnetic field strength, B, and peaking at about 300 G. A variety of resistive loads were connected across the PDC electrodes, extracting continuous electrical power up to 0.44 mW. The power/load curve peaks at 0.44 mW for a 20 kW load indicating the impedance matching condition with the plasma source. The most severe limitation to collector output performance is shown to be plasma conductivity. Collector power drops sharply with increasing neutral gas fill pressure in the glow discharge chamber at constant discharge current indicating that electron collisions with neutral gas atoms are responsible for the reduction in conductivity. Scale-up to higher power has been achieved with the use of a microwave plasma generator. A 3/4 in. long by 0.094 in. dia. PDC anode was magnetized to ~140 G resulting in open circuit PDC voltages in excess of 11.5 V for He plasmas at ~0.75 – 1 Torr and 50 sccm flow. Due to higher conductivity, load matching was now obtained at ~600 W. Langmuir probe results indicate good agreement between the conductivity change and the electron to neutral density ratio scale-up. For this source and electrode configuration, PDC power as high as ~200 mW was demonstrated in He at 0.75 Torr for a microwave input power density of ~8.55 W/cm^3. Considering an electron mean free path as the scale for collector probe influence in the plasma, the peak extracted power density is ~1.61 W/cm^3, corresponding to a volumetric conversion efficiency of ~18.8%.

29. **H. Conrads, R. Mills, Th. Wrubel, "Emission in the Deep Vacuum Ultraviolet from an Incandescently Driven Plasma in a Potassium Carbonate Cell", Plasma Sources Science and Technology, submitted.**

Electromagnetic radiation in both the visible and vacuum ultraviolet (VUV) spectral ranges was emitted from an incandescently driven plasma in a potassium carbonate cell after the potassium carbonate coated on a titanium mesh was heated to above 750°C in a hydrogen atmosphere. The pressure was between 0.1 and 1 mbar, and the hydrogen was dissociated by a hot tungsten wire. Bright visible light filled the annulus between the coaxial tungsten heater and the titanium mesh. This grid was at a floating potential. The emission of the H_α and H_β transitions as well as the L_α and L_β transitions were recorded and analyzed. In the latter spectral range, the spectra showed rotational-vibrational transitions of molecular hydrogen which belong to the Werner-band-system of molecular hydrogen. The plasma generated in the incandescently driven cell had phenomenological similarities to that of low pressure electrical driven discharges such as striations of the plasma or the appearance of unipolar arcs ending on metal surfaces. However, the plasma seemed to be far from thermal equilibrium and dependent on the chemistry of atomic hydrogen with potassium. Details of the

chemistry powering a novel VUV-light source could not be revealed within the frame of this contribution.

30. **R. L. Mills, P. Ray, "Stationary Inverted Lyman Population and a Very Stable Novel Hydride Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Catalysts", International Journal of Engineering Science, submitted.**

Rb^+ to Rb^{2+} and $2K^+$ to $K+K^{2+}$ each provide a reaction with a net enthalpy equal to the potential energy of atomic hydrogen. The presence of these gaseous ions with thermally dissociated hydrogen formed a plasma having strong VUV emission with a stationary inverted Lyman population. We propose an energetic catalytic reaction involving a resonance energy transfer between hydrogen atoms and Rb^+ or $2K^+$ to form a very stable novel hydride ion. Its predicted binding energy of $3.0468\ eV$ with the fine structure was observed at 4071 Å, and its predicted bound-free hyperfine structure lines $E_{HF} = j^2 3.00213\ X\ 10^{-5} + 3.0563\ eV$ (j is an integer) matched those observed for $j=1$ to $j=37$ to within a 1 part per 10^5. This catalytic reaction may pump a cw HI laser.

31. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

By [signature]

Dr. Randell L. Mills

Date: 8/2/02

Publications:

1. H. Conrads, R. Mills, Th. Wrubel, "Emission in the Deep Vacuum Ultraviolet from an Incandescently Driven Plasma in a Potassium Carbonate Cell", Plasma Sources Science and Technology, submitted.
2. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", Chem. Phys. Letts., submitted.
3. R. L. Mills, B. Dhandapani, J. He, "Synthesis and Characterization of a Highly Stable Hydride Surface on a Silicon Wafer", Int. J. Hydrogen Energy, submitted.
4. R. L. Mills, A. Voigt, B. Dhandapani, J. He, "Synthesis and Characterization of Lithium Chloro Hydride", Int. J. Hydrogen Energy, submitted.
5. R. L. Mills, P. Ray, "Substantial Changes in the Characteristics of a Microwave Plasma Due to Combining Argon and Hydrogen", New Journal of Physics, submitted.
6. R. L. Mills, P. Ray, " High Resolution Spectroscopic Observation of the Bound-Free Hyperfine Levels of a Novel Hydride Ion Corresponding to a Fractional Rydberg State of Atomic Hydrogen", Int. J. Hydrogen Energy, submitted.
7. R. L. Mills, E. Dayalan, "Novel Alkali and Alkaline Earth Hydrides for High Voltage and High Energy Density Batteries", Proceedings of the 17th Annual Battery Conference on Applications and Advances, California State University, Long Beach, CA, (January 15-18, 2002), in press.
8. R. Mayo, R. Mills, M. Nansteel, "On the Potential of Direct and MHD Conversion of Power from a Novel Plasma Source to Electricity for Microdistributed Power Applications", IEEE Transactions on Plasma Science, submitted.
9. R. Mills, P. Ray, J. Dong, M. Nansteel, W. Good, P. Jansson, B. Dhandapani, J. He, "Excessive Balmer α Line Broadening, Power Balance, and Novel Hydride Ion Product of Plasma Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", Int. J. Hydrogen Energy, submitted.
10. R. Mills, E. Dayalan, P. Ray, B. Dhandapani, J. He, "Highly Stable Novel Inorganic Hydrides from Aqueous Electrolysis and Plasma Electrolysis", Japanese Journal of Applied Physics, submitted.
11. R. L. Mills, P. Ray, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Glow Discharge and Microwave Hydrogen Plasmas with Certain Catalysts", Chem. Phys., submitted.
12. R. L. Mills, P. Ray, B. Dhandapani, J. He, "Spectroscopic Identification of Fractional Rydberg States of Atomic Hydrogen", J. of Phys. Chem. (letter), submitted.

13. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Rydberg States of Atomic Hydrogen", Chem. Phys. Letts., submitted.
14. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "Spectroscopic Identification of Transitions of Fractional Rydberg States of Atomic Hydrogen", Quantitative Spectroscopy and Energy Transfer, submitted.
15. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", Spectrochimica Acta, Part A, submitted.
16. R. L. Mills, P. Ray, "Spectroscopic Identification of a Novel Catalytic Reaction of Rubidium Ion with Atomic Hydrogen and the Hydride Ion Product", Int. J. Hydrogen Energy, in press.
17. R. Mills, J. Dong, W. Good, P. Ray, J. He, B. Dhandapani, "Measurement of Energy Balances of Noble Gas-Hydrogen Discharge Plasmas Using Calvet Calorimetry", Int. J. Hydrogen Energy, in press.
18. R. L. Mills, A. Voigt, P. Ray, M. Nansteel, B. Dhandapani, "Measurement of Hydrogen Balmer α Line Broadening and Thermal Power Balances of Noble Gas-Hydrogen Discharge Plasmas", Int. J. Hydrogen Energy, in press.
19. R. Mills, P. Ray, "Vibrational Spectral Emission of Fractional-Principal-Quantum-Energy-Level Hydrogen Molecular Ion", Int. J. Hydrogen Energy, in press.
20. R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, Vol. 27, No. 3, pp. 301-322.
21. R. Mills, P. Ray, "Spectroscopic Identification of a Novel Catalytic Reaction of Potassium and Atomic Hydrogen and the Hydride Ion Product", Int. J. Hydrogen Energy, Vol. 27, No. 2, (2002), pp. 183-192.
22. R. Mills, "BlackLight Power Technology-A New Clean Hydrogen Energy Source with the Potential for Direct Conversion to Electricity", Proceedings of the National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001), pp. 671-697.
23. R. Mills, W. Good, A. Voigt, Jinquan Dong, "Minimum Heat of Formation of Potassium Iodo Hydride", Int. J. Hydrogen Energy, Vol. 26, No. 11, Oct., (2001), pp. 1199-1208.
24. R. Mills, "Spectroscopic Identification of a Novel Catalytic Reaction of Atomic Hydrogen and the Hydride Ion Product", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1041-1058.
25. R. Mills, N. Greenig, S. Hicks, "Optically Measured Power Balances of Glow Discharges of Mixtures of Argon, Hydrogen, and Potassium, Rubidium, Cesium, or Strontium Vapor", Int. J. Hydrogen Energy, in press.

26. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Global Foundation, Inc. Orbis Scientiae entitled *The Role of Attractive and Repulsive Gravitational Forces in Cosmic Acceleration of Particles The Origin of the Cosmic Gamma Ray Bursts*, (29th Conference on High Energy Physics and Cosmology Since 1964) Dr. Behram N. Kursunoglu, Chairman, December 14-17, 2000, Lago Mar Resort, Fort Lauderdale, FL, Kluwer Academic/Plenum Publishers, New York, pp. 243-258.
27. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, in press.
28. R. Mills and M. Nansteel, P. Ray, "Argon-Hydrogen-Strontium Discharge Light Source", IEEE Transactions on Plasma Science, in press.
29. R. Mills, B. Dhandapani, M. Nansteel, J. He, A. "Voigt, Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", Int. J. Hydrogen Energy, Vol. 26, No. 9, Sept. (2001), pp. 965-979.
30. R. Mills, "BlackLight Power Technology-A New Clean Energy Source with the Potential for Direct Conversion to Electricity", Global Foundation International Conference on "Global Warming and Energy Policy", Dr. Behram N. Kursunoglu, Chairman, Fort Lauderdale, FL, November 26-28, 2000, Kluwer Academic/Plenum Publishers, New York, pp. 1059-1096.
31. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.
32. R. Mills, M. Nansteel, and Y. Lu, "Excessively Bright Hydrogen-Strontium Plasma Light Source Due to Energy Resonance of Strontium with Hydrogen", Plasma Chemistry and Plasma Processing, submitted.
33. R. Mills, J. Dong, Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", Int. J. Hydrogen Energy, Vol. 25, (2000), pp. 919-943.
34. R. Mills, "Observation of Extreme Ultraviolet Emission from Hydrogen-KI Plasmas Produced by a Hollow Cathode Discharge", Int. J. Hydrogen Energy, Vol. 26, No. 6, (2001), pp. 579-592.
35. R. Mills, "Temporal Behavior of Light-Emission in the Visible Spectral Range from a Ti-K2CO3-H-Cell", Int. J. Hydrogen Energy, Vol. 26, No. 4, (2001), pp. 327-332.
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38. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com.
39. R. Mills, B. Dhandapani, N. Greenig, J. He, "Synthesis and Characterization of Potassium Iodo Hydride", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1185-1203.
40. R. Mills, "Novel Inorganic Hydride", Int. J. of Hydrogen Energy, Vol. 25, (2000), pp. 669-683.
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43. R. Mills, "Novel Hydrogen Compounds from a Potassium Carbonate Electrolytic Cell", Fusion Technology, Vol. 37, No. 2, March, (2000), pp. 157-182.
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Correspondence

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2. R. Mills, Response to I Shechtman, Int J of Hydrogen Energy, Vol. 26, Issue 11, (2001), pp. 1229–1231.
3. R. Mills, Response to A, K. Vijh, Int J of Hydrogen Energy, Vol. 26, Issue 11, (2001), pp. 1233.

Test Reports

Numerous test reports are available from BlackLight Power (e.g. Haldeman, C. W., Savoye, G. W., Iseler, G. W., Clark, H. R., MIT Lincoln Laboratories Excess Energy Cell Final report ACC Project 174 (3), April 25, 1995; Peterson, S., H., Evaluation of Heat Production from Light Water Electrolysis Cells of HydroCatalysis Power Corporation, Report from Westinghouse STC, 1310 Beulah Road, Pittsburgh, PA, February 25, 1994; Craw-Ivanco, M. T.; Tremblay, R. P.; Boniface, H. A.; Hilborn, J. W.; "Calorimetry for a Ni/K_2CO_3 Cell", Atomic Energy Canada Limited, Chemical Engineering Branch, Chalk River Laboratories, Chalk River, Ontario, June 1994; Nesterov, S. B., Kryukov, A. P., Moscow Power Engineering Institute Affidavit, February, 26,1993; Jacox, M. G., Watts, G. R., "The Search for Excess Heat in the Mills Electrolytic Cell", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, January 7, 1993; Gernert, N., Shaubach, R. M., Mills, R., Good, W., "Nascent Hydrogen: An Energy Source," Final Report prepared by Thermacore, Inc., for the Aero Propulsion and Power Directorate, Wright Laboratory, Air Force Material Command (ASC), Wright-Patterson Air Force Base, Contract Number F33615-93-C-2326, May, (1994); Phillips, J., Smith, J., Kurtz, S., "Report On Calorimetric Investigations Of Gas-Phase Catalyzed Hydrino Formation" Final report for Period October-December 1996", January 1, 1997, A Confidential Report submitted to BlackLight Power, Inc. provided by BlackLight Power, Inc., Great Valley Corporate Center, 41 Great Valley Parkway, Malvern, PA 19355; B. N. Popov, "Electrochemical Characterization of BlackLight Power, Inc. MH as Electrodes for Li-ion Batteries, Dept. of Chemical Engineering, University of South Carolina, February 6, 2000; Scores of Independent Tests of BlackLight Power's Novel Hydride Compounds from over 20 Independent Testing Laboratories.)

Upcoming Conference Presentations

1. R. L. Mills, J. Dong, J. He, B. Dhandapani, W. Good, A. Voigt, S. Hicks, M. Nansteel, E. Dayalan, P. Chandra, "Spectroscopic Identification of a Novel Catalytic Reaction of Hydrogen", Division of Inorganic Chemistry, Oral Presentation, 223rd ACS National Meeting, (April 7–11, 2002), Orlando, FL.
2. R. L. Mills, J. Dong, J. He, B. Dhandapani, W. Good, A. Voigt, S. Hicks, M. Nansteel, E. Dayalan, P. Chandra, "Novel Catalytic Reaction of Hydrogen as a Potential New Energy Source", Division of Inorganic Chemistry, Oral Presentation, 223rd ACS National Meeting, (April 7–11, 2002), Orlando, FL.

3. R. L. Mills, J. Dong, J. He, B. Dhandapani, W. Good, A. Voigt, S. Hicks, M. Nansteel, E. Dayalan, P. Chandra, "Novel Catalytic Reaction of Hydrogen as a Potential New Energy Source", Division of Industrial and Engineering Chemistry, Oral Presentation, 223rd ACS National Meeting, (April 7–11, 2002), Orlando, FL.
4. R. L. Mills, J. Dong, J. He, B. Dhandapani, W. Good, A. Voigt, S. Hicks, M. Nansteel, E. Dayalan, P. Chandra, "Novel Catalytic Reaction of Hydrogen as a Potential New Energy Source", Catalysis and Surface Science Secretariat, Oral Presentation, 223rd ACS National Meeting, (April 7–11, 2002), Orlando, FL.
5. R. L. Mills, J. Dong, J. He, B. Dhandapani, W. Good, A. Voigt, S. Hicks, M. Nansteel, E. Dayalan, P. Chandra, "Novel Catalytic Reaction of Hydrogen as a Potential New Energy Source", Division of Physical Chemistry, Poster Presentation, 223rd ACS National Meeting, (April 7–11, 2002), Orlando, FL.
6. R. L. Mills, J. Dong, J. He, B. Dhandapani, W. Good, A. Voigt, S. Hicks, M. Nansteel, E. Dayalan, P. Chandra, "Novel Catalytic Reaction of Hydrogen as a Potential New Energy Source", Division of Physical Chemistry, Sci-Mix Poster Presentation, 223rd ACS National Meeting, (April 7–11, 2002), Orlando, FL.
7. R. M. Mayo, R. L. Mills, M. Nansteel, "Direct Plasmadynamic Conversion of Plasma Thermal Power from a Novel Plasma Source to Electricity for Microdistributed Power Applications", 40th Power Sources Conference, (June 6–13, 2002), Cherry Hill, NJ.
8. R. L. Mills, E. Dayalan, "Novel Alkali and Alkaline Earth Hydrides for High Voltage and High Energy Density Batteries", Proceedings of the 17th Annual Battery Conference on Applications and Advances, California State University, Long Beach, CA, (January 15-18, 2002), in press.

Prior Conference Presentations

1. R. Mills, "Novel catalytic reaction of hydrogen as a potential new energy source", Division of Industrial and Engineering Chemistry; Session: Industrial Bio-Based Technology, 222nd American Chemical Society Fall National Meeting, (August 26–30, 2001), Chicago, IL.
2. R. Mills, "Spectroscopic identification of a novel catalytic reaction of hydrogen", Division of Inorganic Chemistry; Session: Catalysis, 222nd American Chemical Society Fall National Meeting, (August 26–30, 2001), Chicago, IL.
3. R. Mills, "Spectroscopic identification of a novel catalytic reaction of hydrogen", Division of Physical Chemistry; Session: Physical Chemistry Poster Session, 222nd American Chemical Society Fall National Meeting, (August 26–30, 2001), Chicago, IL.

4. P. Ray, R. Mills, "Spectroscopic identification of a novel catalytic reaction of hydrogen plasma", Session ET1: Lighting, American Physical Society Meeting, 54th Annual Gaseous Electronics Conference, October 9–12, 2001, Pennsylvania State University, State College, PA.
5. R. Mills, J. He, "Spectroscopic Identification of a Novel Catalytic Reaction of Atomic Hydrogen and the Hydride Ion Product", National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001).
6. R. Mills, B. Dhandapani, M. Nansteel, N. Greenig, S. Hicks, J. Dong, "Optically Measured Power Balances of Anomalous Discharges of Mixtures of Argon, Hydrogen, and Potassium, Rubidium, Cesium, or Strontium Vapor", National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001).
7. R. Mills, M. Nansteel, N. Greenig, S. Hicks, "BlackLight Power Technology-A New Clean Energy Source with the Potential for Direct Conversion to Electricity", National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001).
8. R. Mills, B. Dhandapani, M. Nansteel, J. He, A. Voigt, "Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001).
9. R. Mills, "BlackLight Power Technology-A New Clean Energy Source with the Potential for Direct Conversion to Electricity", *The 8 th Annual Emerald Groundhog Day Investment Forum*, February 1, 2001, Wyndham Franklin Plaza Hotel, Philadelphia, PA, Organized by Emerald Asset Management, Lancaster, PA.
10. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Global Foundation, Inc. Orbis Scientiae entitled *The Role of Attractive and Repulsive Gravitational Forces in Cosmic Acceleration of Particles The Origin of the Cosmic Gamma Ray Bursts*, (29th Conference on High Energy Physics and Cosmology Since 1964) Dr. Behram N. Kursunoglu, Chairman, December 14-17, 2000, Lago Mar Resort, Fort Lauderdale, FL.
11. R. Mills, "BlackLight Power Technology-A New Clean Energy Source with the Potential for Direct Conversion to Electricity", Global Foundation, Inc. conference entitled *Global Warming and Energy Policy*, Fort Lauderdale, FL, November 26-28, 2000.
12. R. Mills, B. Dhandapani, N. Greenig, J. He, J. Dong, Y. Lu, and H. Conrads, "Formation of an Energetic Plasma and Novel Hydrides from Incandescently Heated Hydrogen Gas with Certain

Catalysts", August National ACS Meeting (220th ACS National Meeting, Washington, DC, (August 20-24, 2000)).

13. R. Mills, J. He, and B. Dhandapani, "Novel Alkali and Alkaline Earth Hydrides", August National ACS Meeting (220th ACS National Meeting, Washington, DC, (August 20-24, 2000)).
14. R. Mills, B. Dhandapani, N. Greenig, J. He, J. Dong, Y. Lu, and H. Conrads, "Formation of an Energetic Plasma and Novel Hydrides from Incandescently Heated Hydrogen Gas with Certain Catalysts", June ACS Meeting (29th Northeast Regional Meeting, University of Connecticut, Storrs, CT, (June 18-21, 2000)).
15. Mills, J. Dong, N. Greenig, and Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", 219 th National ACS Meeting, San Francisco, California, (March 26-30, 2000).
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19. R. Mills, J. Dong, N. Greenig, and Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", National Hydrogen Association, 11 th Annual U.S. Hydrogen Meeting, Vienna, VA, (February 29-March 2, 2000).
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22. R. Mills, J. He, and B. Dhandapani, "Novel Alkali and Alkaline Earth Hydrides", National Hydrogen Association, 11 th Annual U.S. Hydrogen Meeting, Vienna, VA, (February 29-March 2, 2000).
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